CLAIMS

What is claimed is:

1. A system to process a wafer, comprising:

a semiconductor processing equipment comprising mechanical components to process the wafer;

one or more acoustic transducers positioned on the mechanical components in a location of possible unwanted contact with the wafer and receiving acoustic emissions generated by the mechanical components and outputting signals indicative thereof; and

a controller comparing in-situ the output signals with sound signals of each mechanical component to determine therefrom whether there is unwanted contact with the wafer, wherein the sound signals of each mechanical component correspond to the mechanical component not making unwanted contact with the wafer when processing the wafer.

2. The system as recited in claims 1, wherein the controller automatically stops the processing of the wafer when determining that there is unwanted contact with the wafer.

3. The system as recited in claims 1, wherein the controller performs an acoustic survey on the semiconductor processing system to determine which of the mechanical components to mount the acoustic transducers to detect the unwanted contact between the mechanical component and the wafer or to detect noise from unwanted dust particles that scratch the IC pattern.

4. The system as recited in claim 1, wherein when the output signals are outside a range of the sound signal, the controller automatically stops the processing of the wafer.

5. The system as recited in claim 1, wherein the semiconductor processing equipment further comprises:

a cassette stage holding the wafer during processing;

a buffer chamber; and

a process chamber, wherein the acoustic transducers are mounted on the robot arm or a base of an axel on which the robot arm rotates, on a base of a lead screw of the cassette stage, the buffer chamber, and/or on doorways or slit valve door openings between the buffer chamber and the process chamber of the semiconductor processing equipment.

6. The system as recited in claim 5, wherein the semiconductor processing equipment further comprises:

a frog leg robot; and

a loadlock chamber housing the cassette stage, wherein the acoustic transducers are mounted on the frog leg robot, on the loadlock chamber, on the robot arm, proximate to a contact region between the wafer and a robot blade, on a driving mechanism of the cassette stage holding the wafer, and/or on a base, on a sidewall, and/or an interior portion of the loadlock chamber.

7. The system as recited in claim 1, wherein the acoustic transducers are an integral part of the semiconductor processing equipment.

8. The system as recited in claim 1, wherein when the controller receives the output signals from the acoustic transducers, the controller receives a trigger signal from each mechanical component triggering a pattern recognition to analyze the output signals corresponding to the acoustic transducers.

9. The system as recited in claim 1, wherein each output signal is indicative of measured acoustic waveforms associated with each mechanical component and the acoustic transducers outputting the trigger signal.

10. The system as recited in claim 1, wherein the controller further comprises:

a signal processor having a pattern recognition capability to analyze the output signals of the acoustic transducers;

a data acquisition system receiving and storing the output signals and transferring the output signals to the signal processor, wherein the signal processor analyzes the output signals by comparing the output signals with the corresponding sound signals, associated with the mechanical component.

11. The system as recited in claim 1, wherein the signal processor outputs a graphical output of the acoustic signals and the sound signals indicative of whether a significant amount of deviation exists between the acoustic signals and the sound signals.

12. The system as recited in claim 1, wherein when the controller automatically stops the processing of the wafer, the controller outputs an alarm signal indicative thereof.

13. The system as recited in claim 1, further comprising:

a graphical output graphically displaying the compared signals or the wafer for an operator to validate or monitor.

14. The system as recited in claim 1, wherein the controller compares the output signals and the sound signals only at predetermined manufacturing stages when there is a risk of the wafer from being damaged

15. A semiconductor processing method of a system comprising mechanical components to process a wafer, the method comprising:

mounting one or more acoustic transducers on the mechanical components in a location of possible unwanted contact with the wafer;

receiving acoustic emissions generated by the mechanical components and outputting signals indicative thereof;

comparing in-situ the output signals with a sound signal to determine therefrom whether there is unwanted contact with the wafer, wherein the sound signals of each mechanical component correspond to the mechanical component not making unwanted contact with the wafer when processing the wafer

16. The method as recited in claims 15, further comprising:

automatically stopping the processing of the wafer when determining that there is unwanted contact with the wafer.

17. The method as recited in claim 15, further comprising:

performing an acoustic survey to select the mechanical components to be monitored and the sound signals that each selected mechanical component generates during a normal operation and during which no significant damage or scratching is done to the wafer during processing.

18. The method as recited in claim 15, further comprising:

when receiving the output signals from the acoustic transducers, receiving a trigger signal from each mechanical component triggering a pattern recognition to analyze the output signals corresponding to the acoustic transducers.

19. The method as recited in claim 15, wherein the signal processor outputs a graphical output of the acoustic signals and the sound signals indicative of whether a significant amount of deviation exists between the acoustic signals and the sound signals.

20. The method as recited in claim 15, wherein the processing of the wafer is automatically stopped and further comprising:

outputting an alarm signal indicative that the processing of the wafer is automatically stopped.

21. The method as recited in claim 15, further comprising:

graphically displaying the compared signals or the wafer for an operator to validate or monitor.

22. The method as recited in claim 15, wherein the comparing of the output signals and the sound signals is performed only at predetermined manufacturing stages when there is a risk of the wafer from being damaged.

23. A system initialization process for a normal production of an integrated circuit (IC) pattern of a wafer, comprising:

acoustically auditing a semiconductor processing equipment to select mechanical components to be monitored;

mounting one or more acoustic transducers and a recording device on the mechanical components selected for monitoring;

monitoring each selected mechanical component only at predetermined manufacturing stages when there is a risk of the wafer from being damaged;

recording output signals of the selected mechanical components when operating during the predetermined manufacturing stages;

setting-up the mechanical components to make unwanted contact with a surface of the wafer;

recording acoustic emission training set signals for pattern recognition of the output signals of the selected mechanical components when there is unwanted contact;

adjusting back the selected mechanical components so that the mechanical components do not make unwanted contact with the surface of the wafer;

recording the output signals generated by the selected mechanical components at the normal production as the sound signals; and

beginning the normal production of the IC pattern and monitoring the output signals from the selected mechanical components for unwanted contact.

24. The process as recited in claim 23, wherein the recording selected manufacturing stages of is performed manually by the operator or in an autonomous manner, without any human intervention.

25. The process as recited in claim 23, wherein a current flowing in an armature of the mechanical components triggers the recording of the output signals.

26. The process as recited in claim 23, further comprising:

attaching an event identification to the predetermined manufacturing stages.